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Title: DISPLAY DEVICES ;

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Equivalents: ;

**ABSTRACT:**

A display arrangement suitable for use in road traffic lights or motorway advisory signs comprises at least one display 7, 9, 12, 13 including a plurality of light emitting diodes or a high frequency discharge tube (not shown) controlled by a logic arrangement 3 and powered by a battery 1 whose charge is maintained by a solar panel 2. A plurality of LED arrays 7-9 may be provided to represent the red to green lighting sequence. This function may alternatively be provided by control of LCD shutters placed in front of a discharge tube. The logic 3 includes a microprocessor 4 for control of various switches determining the type of display and for charging of the battery 1. The timing of the display sequence for various purposes is controlled by conventional control arrangements indicated in the drawing.

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## (54) Display devices

(57) A display arrangement suitable for use in road traffic lights or motorway advisory signs comprises at least one display 7, 9, 12, 13 including a plurality of light emitting diodes or a high frequency discharge tube (not shown) controlled by a logic arrangement 3 and powered by a battery 1 whose charge is maintained by a solar panel 2. A plurality of LED arrays 7-9 may be provided to represent the red to green lighting sequence. This function may alternatively be provided by control of LCD shutters placed in front of a discharge tube. The logic 3 includes a microprocessor 4 for control of various switches determining the type of display and for charging of the battery 1. The timing of the display sequence for various purposes is controlled by conventional control arrangements indicated in the drawing.

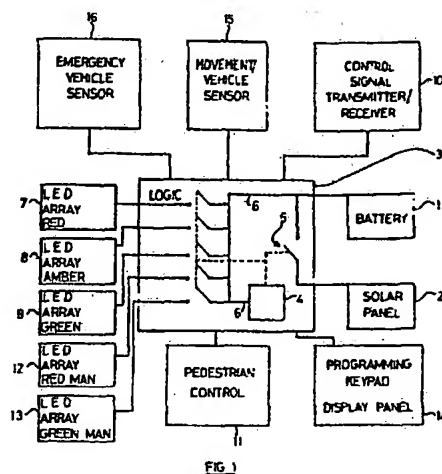
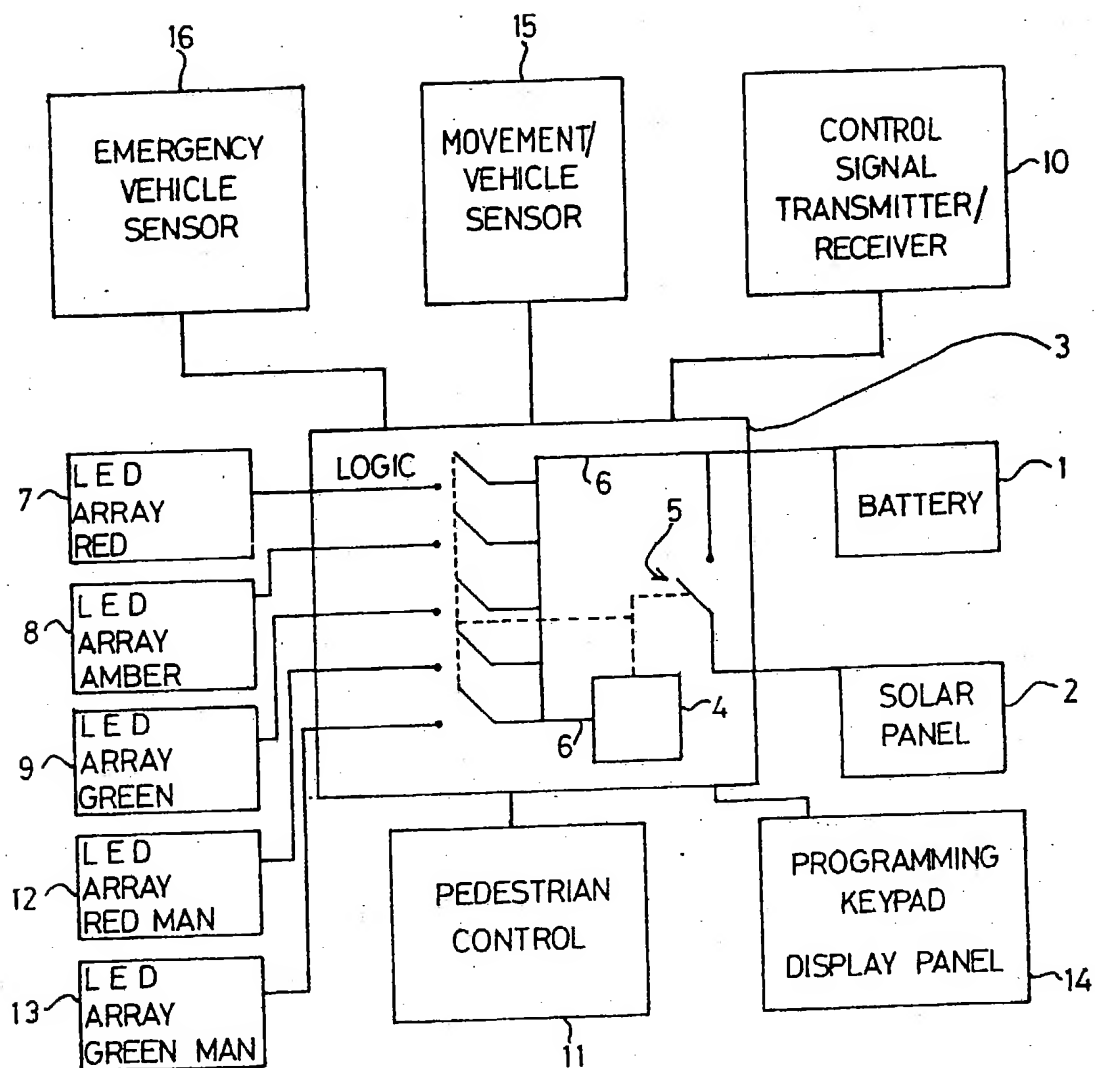


FIG. 1

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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FIG. 1

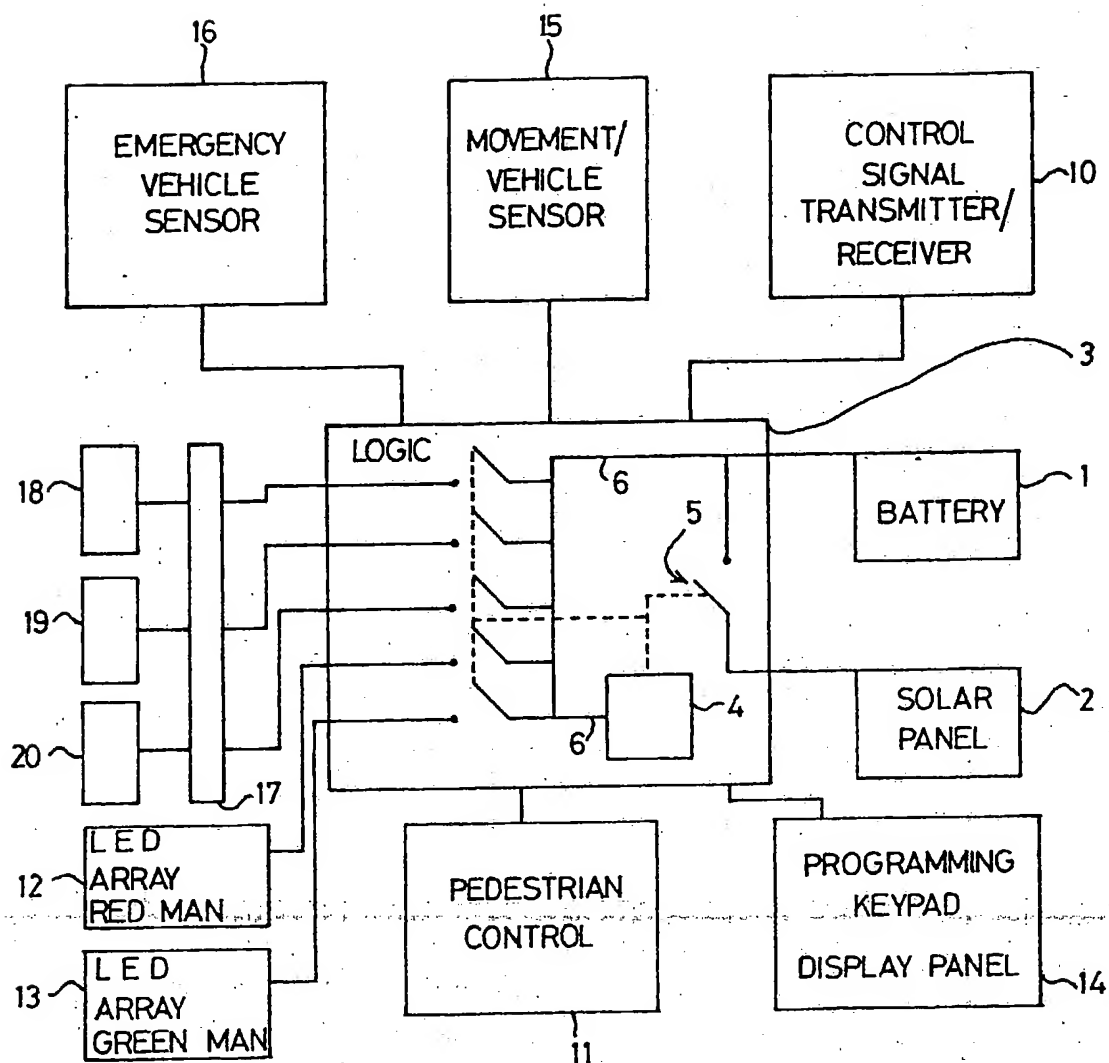


FIG 2

## DESCRIPTION OF INVENTION

Improvements in or relating to a display device

5 THE PRESENT INVENTION relates to a display device and more particularly to an illuminated display device such as a display device adapted to provide visible signals to motorists. As will become clear, from the following description, a preferred embodiment of the invention  
10 comprises a traffic light apparatus.

At the present point in time, traffic lights in general use are either permanent traffic lights, which are connected to a mains electricity supply, or  
15 are temporary traffic lights, which are powered by an appropriate generator.

The traffic lights that are connected to the main electricity supply do consume electricity from that  
20 mains supply, and also work at the conventional mains voltage of 240 volts AC. If an accident should arise which causes the partial destruction of the traffic light apparatus, it is possible that a wire carrying the 240 electric supply may be exposed. This may present a  
25 hazzard in that a spark may be created which could initiate a fire, particularly if the accident has involved the spillage of petrol, and also, if the accident should occur under wet conditions there is a particular risk of electrocution.

30 As far as the generator powered temporary traffic lights are concerned, the generators utilised are generally diesel powered, and are thus noisy, and frequently also pollute the atmosphere.

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According to this invention there is provided an illuminated display arrangement, said display device comprising a battery, a solar panel to maintain the charge in the battery, at least one display comprising a plurality of light emitting diodes on a high frequency discharge tube, and a logic arrangement adapted to control the display.

Preferably a plurality of said light emitting displays are provided.

Alternatively the high frequency discharge tube is associated with one or more optical shutters.

Conveniently the or each shutter is a liquid crystal device.

Preferably the or each shutter will only pass light of one predetermined colour.

Conveniently the logic arrangement is associated with at least one signal receiving means adapted to receive signals transmitted from a remote location, to enable the operation of the display to be controlled from said remote location.

Preferably the signal receiving means is also associated with corresponding signal transmitting means adapted to transmit signals of the same type as received by the receiver.

Said signals may comprise radio signals, coded infra-red signals, or ultrasonic signals.

Preferably the arrangement is in the form of a traffic light arrangement having at least three light emitting diode displays emanating, respectively, red,

amber and green light. Alternatively the arrangement may have three of said shutters adapted to pass, respectively, red, amber and green light.

5            Conveniently means are provided to detect a vehicle or person approaching the traffic light.

             Said vehicle or person detecting means may comprises an ultra sonic sound transmitter and an ultra-  
10        sonic sound detector and means to determine the presence of a doppler shift, heat sensitive means, or a radar.

             Preferably means are provided, which are manually operable, to be operated by a pedestrian to effect  
15        some degree of control on the sequency of the traffic lights.

             Conveniently the arrangement is provided with a programming key-pad, adapted to enable a logic control  
20        arrangement to be programmed to provide a desired sequencing of the traffic lights.

             In order that the invention may be more readily understood, and so that further features thereof may  
25        be appreciated the invention will now be described, by way of example, with reference to the accompanying drawings, in which

             FIGURE 1 is a block diagram of one embodiment  
30        of the invention, and

             FIGURE 2 is a corresponding block diagram of a modified embodiment of the invention.

35            The block diagram that forms Figure 1 of the accompanying drawings illustrates various features which may be present in various embodiments of the in-

vention. It is to be understood that it is envisaged that not all the features of the invention to be described will necessarily be present in each embodiment of the invention.

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Referring now to Figur 1 of the drawings it is to be understood that the block diagram illustrates the electronic arrangement of a traffic light arrangement.

10

The primary source or power for the traffic light is a rechargeable battery 1, which may be a sealed battery of the lead-acid type operating at 12 volts.

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The described arrangement also includes a solar panel 2 adapted to convert solar illumination in to electricity. Such panels are known. The panel is connected, via a logic arrangement 3, to the battery. The logic arrangement 3 includes a micro processor 4, which may, for example, be a Hitachi 64180. The micro processor is adapted to control a power transistor switch 5 in order to connect the solar panel to the battery, and the microprocessor is also connected by means of a lead 6 to be able to determine the output voltage of the battery 1. Thus the microprocessor effectively controls the charging of the battery from the solar panel.

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The micro processor is also adapted to control, by means of appropriate power transistor switches, three separate light emitting diode displays, 7, 8, 9. The three light emitting diode displays occupy the conventional position of traffic lights and comprise a display 7 emitting red light, a display 8 emitting amber light, and a display 9 emitting green light. Each display consists of a plurality of light emitting diodes located close to each other, and thus the resultant com-



5 combination of the light emitting diode displays is similar to a conventional traffic light which incorporates incandescent bulbs. However, the electric power required to drive a light emitting diode display is much less than the power required to drive an incandescent bulb with the same light output.

10 The micro processor is adapted to control the light emitting diode displays 7, 8, 9, so that the displays are illuminated and extinguished at appropriate times. However, the micro processor may also be programmed so as only to activate selected diodes from any particular display, thus enabling a display, if so desired, to have only the part thereof forming an arrow to be illuminated, or permitting part of a display having the configuration of a walking man to be illuminated.

20 The described arrangement may, of course, include a plurality of separate light emitting diode displays of each colour, as described, positioned appropriately, with the displays all being connected directly to the described logic arrangement.

25 It is envisaged that a traffic light arrangement as described above may be of particular use as a "temporary" arrangement. Such an arrangement is frequently utilised where part of a road is undergoing repair, and a road that is normally a two-lane road is reduced in width, thus necessitating the use of temporary lights so that traffic only passes down the portion of the road in question in one direction at a time. In such an arrangement it is presently necessary to provide a wire connecting the two spaced-apart sets of traffic lights to a common control.

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However, the present invention envisages that the logic arrangement which controls the traffic lights

may be associated with a signal transmitter and receiver  
10 adapted to transmit signals to, and receive signals  
from, a corresponding remote arrangement. Whilst such a  
signal transmitter and receiver may comprise a radio  
5 transmitter receiver, or an ultrasonic signal trans-  
mitter and receiver, in the presently preferred embodi-  
ment of the invention a signal transmitter and receiver  
is provided which emits coded infrared light pulses, and  
which is adapted to receive and de-code such pulses.

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It will thus be understood that two traffic  
light arrangements, as described, may be located at  
either ends of a section of road which is under repair,  
and the two traffic light arrangements may communicate  
15 with each other by means of the signal transmitters and  
receivers, thus ensuring that the traffic lights operate  
in a satisfactory manner.

The logic arrangement described above will,  
20 of course, be programmed to ensure an appropriate con-  
trol of the timing of the lights, and in the arrangement  
described above, one of the traffic light arrangements  
would be the "master" arrangement, controlling the pri-  
mary timing of the changing of the lights, and the other  
25 traffic light arrangement would be a "slave" arrange-  
ment.

The described traffic light may form part of a  
series of traffic lights which are fixed in position, at  
30 a road junction or the like. It will be appreciated  
that the traffic lights need not, in such a case, be  
connected together by means of wires passing under the  
road, but instead are operatively connected together by  
the described transmitter and receiver arrangement in-  
35 corporating the infra-red link. In such an embodiment  
of the invention it is envisaged that it may be desir-  
able to provide a button to be operated by a pedestrian

wishing to cross the road. The display lights may, in such a case, include a special display arrangement adapted to indicate to a pedestrian that it is safe to cross the road, such as, for example, a display of red light emitting diodes 12 having the configuration of a standing man, and a display of green light emitting diodes 13 having the configuration of a walking man.

However, it will be appreciated that if traffic lights in accordance with the invention are to be utilised as temporary traffic lights, it may well be desirable to be able to re-program the traffic lights, to allow for different relevant timing of the lights, since the time delay between the respective changes of the lights of traffic lights provided at roadworks does depend upon the length of the section of road that is of reduced width. Thus, in the presently described embodiment of the invention, keypad means 14 are provided, which may be associated with a small light emitting diode display or liquid crystal displacing, to enable the logic to be re-programmed to provide an appropriate timing sequence for the lights. The programming key pad may be remote from the actual traffic light installation, being connected thereto by a radio or optical link.

The traffic light arrangement may incorporate a device 15 to determine when a vehicle approaches the traffic light or is located in front of the traffic light. One example of such an arrangement is an ultrasonic device which repeatedly transmits pulses of ultrasound and is provided with a detector to detect reflections of the ultrasound. The detector is associated with a doppler shift detecting device and if the detector detects a signal which carries a doppler shift such as may be caused by an approaching motor vehicle or cyclist, then an output signal is generated and fed to

the logic arrangement to indicate that such a vehicle or cyclist is approaching. However, alternative devices may be used such as, for example, a heat sensitive arrangement adapted to respond to heat emitted by a motor vehicle engine, or other part of a motor vehicle or by a person on a bicycle, or even a radar arrangement may be utilised. Such a radar arrangement would rely on doppler shift.

The traffic light arrangement may also include a further device 16 responsive to a radio or infra red signal from a transmitter on an emergency vehicle, such as a fire engine or ambulance, to enable the ordinary sequencing of the lights to be over-ridden to make all the lights show red, except the lights in the direction from which the emergency vehicle approaches the traffic lights. Of course the arrangement 16 may, if preferred, be incorporated in the receiver 10.

Referring now to Figure 2 of the drawings it can be seen that the arrangement is the same as described in Figure 1 save that the LED arrays 7, 8 and 9 have been replaced with a single light source, and three liquid crystal display elements 18,19,20.

The light source 17 comprises a 3 watt neon discharge tube which receives power from a free running 35 KH<sub>3</sub> oscillator driven by the battery 1. Located in front of the tube are the three liquid crystal devices which effectively operate as shutters. The devices are such that when an appropriate voltage is applied thereto each device will permit light to pass through. However, each device either has a liquid crystal material which only permits light of a selected colour to pass, or each device is associated with a colour filter. In any event the liquid crystal shutter 18 will only pass red light, the shutter 19 will only pass amber light, and the

shutter 20 will only pass green light. Whenever the micro processor 4 closes the appropriate power transistor switch the light source 17 is activated and a selected shutter 18,19 or 20 is opened.

5

The embodiment shown in Figure 2 operates, in all other respects, the same way as the embodiment shown in Figure 1.

10

In a further modification each of the displays 12 and 13 may be replaced by a light source corresponding to the light source 17, and shutters corresponding to the shutters 18 to 20, but adapted to pass light in the form of images of a red man and a green man respectively.

15

Whilst the invention has been described by way of example with primary reference to an embodiment of the invention in the form of traffic lights (either traffic lights permanently fixed in position or temporary traffic lights) it is to be appreciated that the invention, in its broader aspects, also applies to other illuminated display devices for motorists, such as display devices presently found on motorways or the like to provide an indication of temporary speed limits or temporary lane closures. It is envisaged that such display arrangements may be battery powered, with a solar panel to maintain the charge in the battery, and the display may be provided with a receiver adapted to receive either radio control signals from a remote base, or a receiver adapted to receive pulse coded infra-red signals, for example from a hand-held infra-red transmitter, which may be operated by a police officer from a police vehicle. Thus the display devices may be controlled from a remote base, by means of the radio control, or may be controlled by police officers on-the-spot.

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It will be appreciated that the described embodiments of the invention may operate at a low voltage, for example 12 volts, thus minimising any risk of sparking or electrocution should an accident occur involving the display device.

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CLAIMS:

1. An illuminated display arrangement, said display device comprising a battery, a solar panel to maintain the charge in the battery, at least one display comprising a plurality of light emitting diodes on a high frequency discharge tube, and a logic arrangement adapted to control the display.
2. An arrangement according to Claim 1 wherein a plurality of said light emitting displays are provided.
3. An arrangement according to Claim 1 wherein the high frequency discharge tube is associated with one or more optical shutters.
4. An arrangement according to Claim 3 wherein the or each shutter is a liquid crystal device.
5. An arrangement according to Claims 3 or 4 wherein the or each shutter will only pass light of one predetermined colour.
6. An arrangement according to any one of the preceding Claims wherein the logic arrangement is associated with at least one signal receiving means adapted to receive signals transmitted from a remote location, to enable the operation of the display to be controlled from said remote location.
7. An arrangement according to Claim 6 wherein the signal receiving means is also associated with corresponding signal transmitting means adapted to transmit signals of the same type as received by the receiver.
8. An arrangement according to Claim 6 or

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Claim 7 wherein said signals comprise radio signals.

5        9.        An arrangement according to Claim 6 or  
         Claim 7 wherein said signals comprise coded infra-red  
         signals.

10       10.       An arrangement according to Claim 6 or  
         Claim 7 wherein said signals comprise ultrasonic  
         signals.

15       11.       An arrangement according to any one of  
         Claims 1, 2, or 6 to 10 in the form of a traffic light  
         arrangement having at least three light emitting diode  
         displays emanating, respectively, red, amber and green  
         light.

20       12.       An arrangement according to Claim 5 having  
         three shutters adapted to pass, respectively, red, amber  
         and green light.

         13.       An arrangement according to Claim 11 or 12  
         wherein means are provided to detect a vehicle or person  
         approaching the traffic light.

25       14.       An arrangement according to Claim 13 wherein  
         said vehicle or person detecting means comprises an  
         ultra sonic sound transmitter and an ultrasonic sound  
         detector and means to determine the presence of a  
         doppler shift.

30       15.       An arrangement according to Claim 13 wherein  
         the person or vehicle detecting means comprise heat sen-  
         sitive means.

35       16.       An arrangement according to Claim 13 wherein  
         the person or vehicle detecting means comprises a radar.



17. An arrangement according to any one of  
Claims 11 to 17 wherein means are provided, which are  
manually operable, to be operated by a pedestrian to  
effect some degree of control on the sequencing of the  
5 traffic lights.

18. An arrangement according to any one of  
Claims 11 to 17 provided with a programming key-pad,  
adapted to enable a logic control arrangement to be pro-  
10 grammed to provide a desired sequencing of the traffic  
lights.

19. A display arrangement substantially as herein  
described with reference to and as shown in Figure 1 of  
15 the accompanying drawings.

20. A display arrangement substantially as herein  
described with reference to and as shown in Figure 2 of  
the accompanying drawings.

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21. Any novel feature or combination of features  
disclosed herein.

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